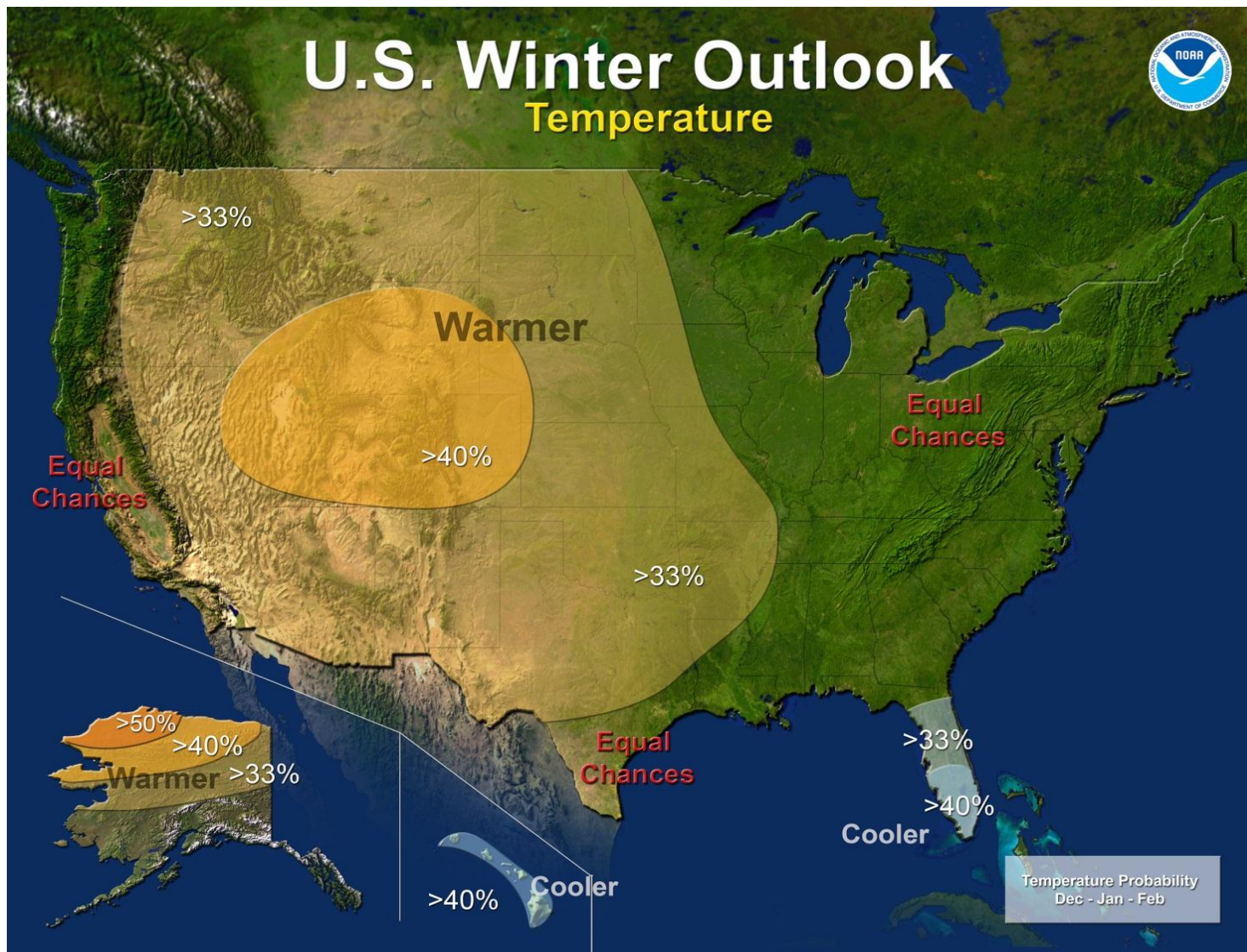




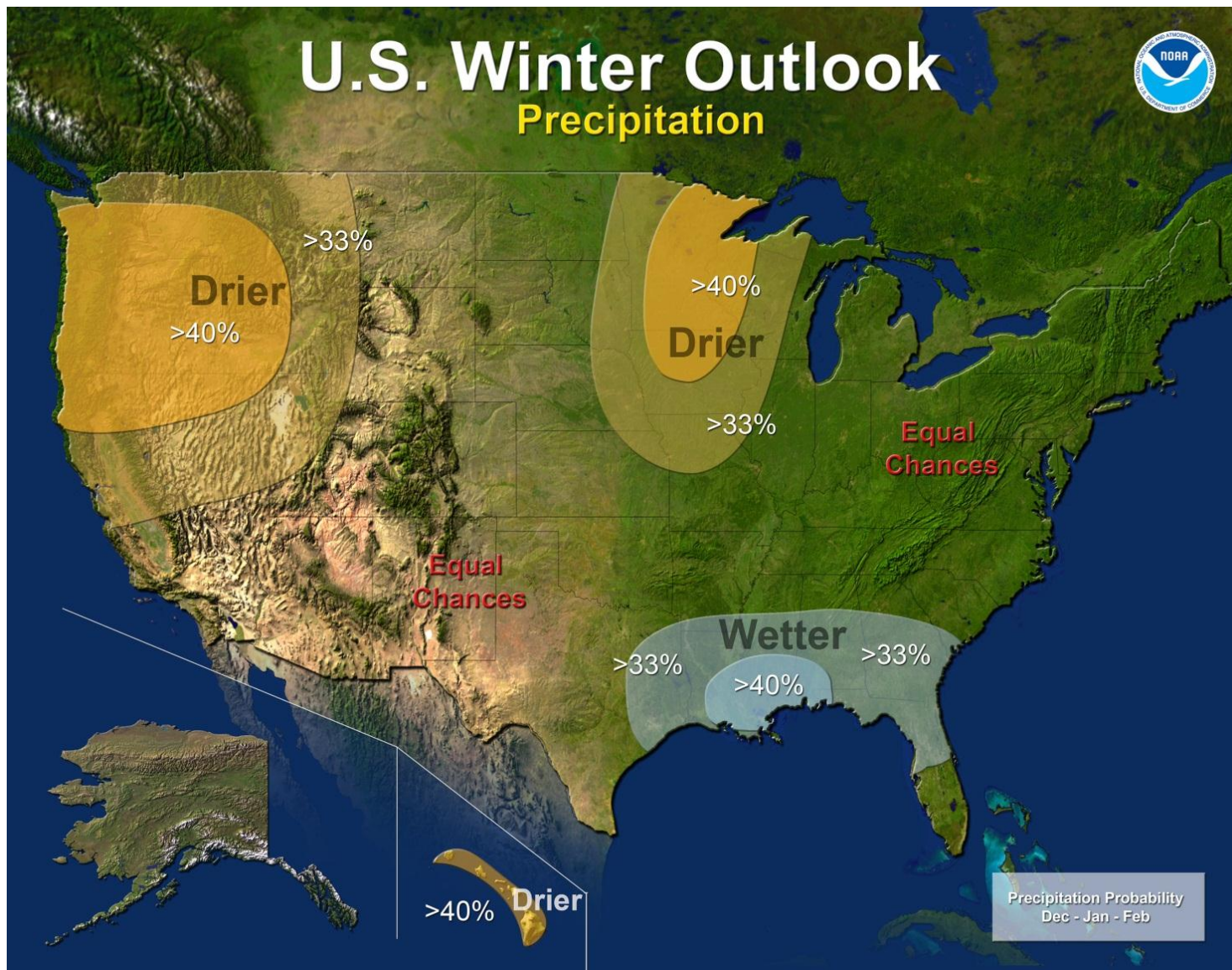
WINTER OUTLOOK 2012-13

**NOAA/NWS PADUCAH, KY
MIKE YORK, FORECASTER**

“Superstorm Sandy” in West Virginia, photo courtesy Beau Dodson



TEMPERATURES-WINTER 2012-13



PRECIPITATION-WINTER 2012-13

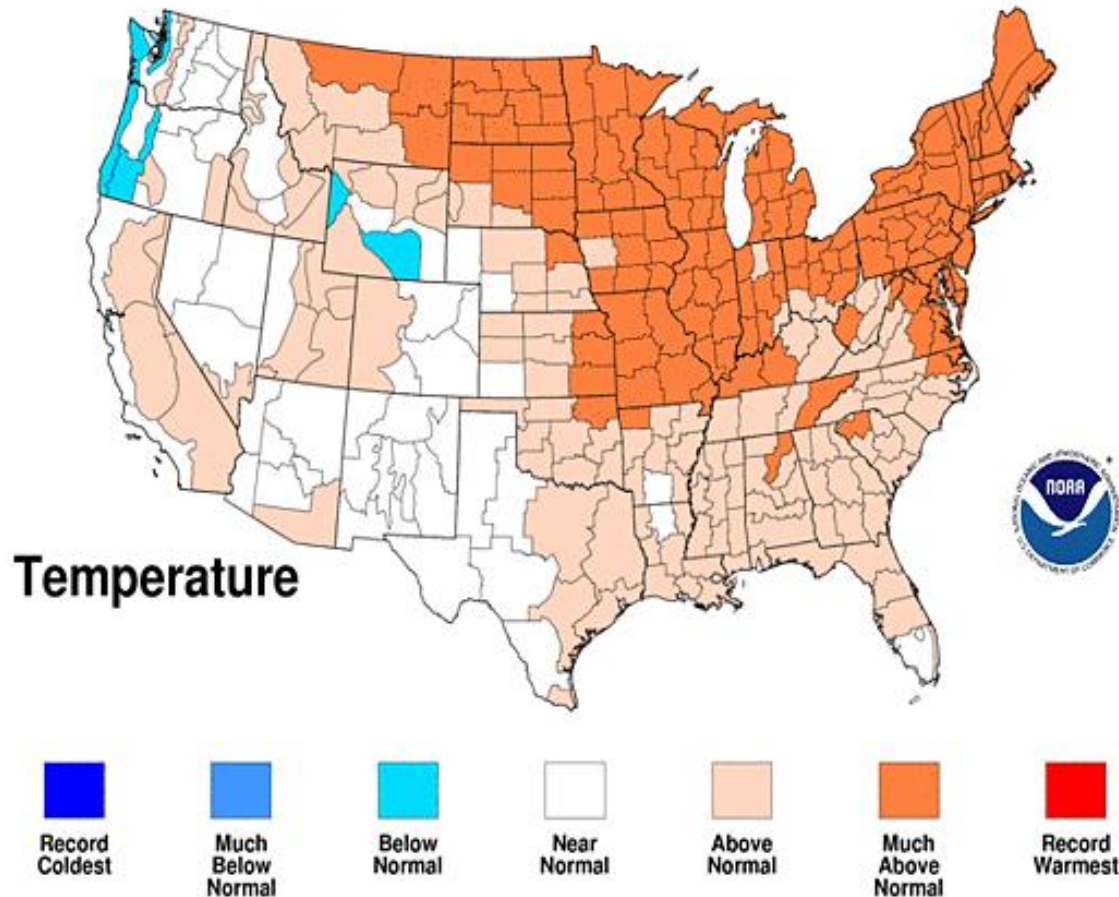
FORECAST FOR LAST WINTER



THE *ACTUAL* (OBSERVED) TEMPS

Dec 2011 - Feb 2012 Divisional Ranks

National Climatic Data Center/NESDIS/NOAA



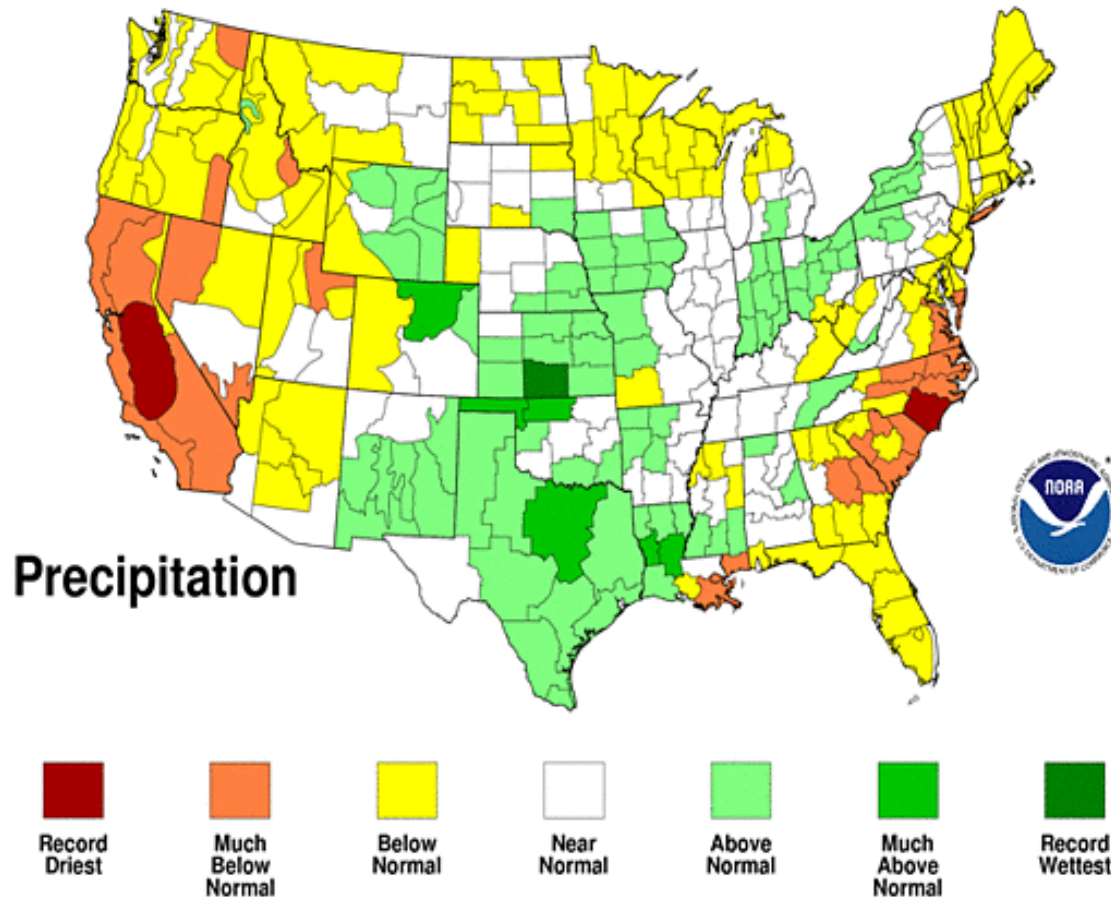
FORECAST FOR LAST WINTER



THE *ACTUAL* (OBSERVED) PRECIP

Dec 2011 - Feb 2012 Divisional Ranks

National Climatic Data Center/NESDIS/NOAA



WHY THE FORECAST BUSTS?

Primary forecast input to winter outlooks:

La Nina / El Nino (Pacific Ocean phenomenon)

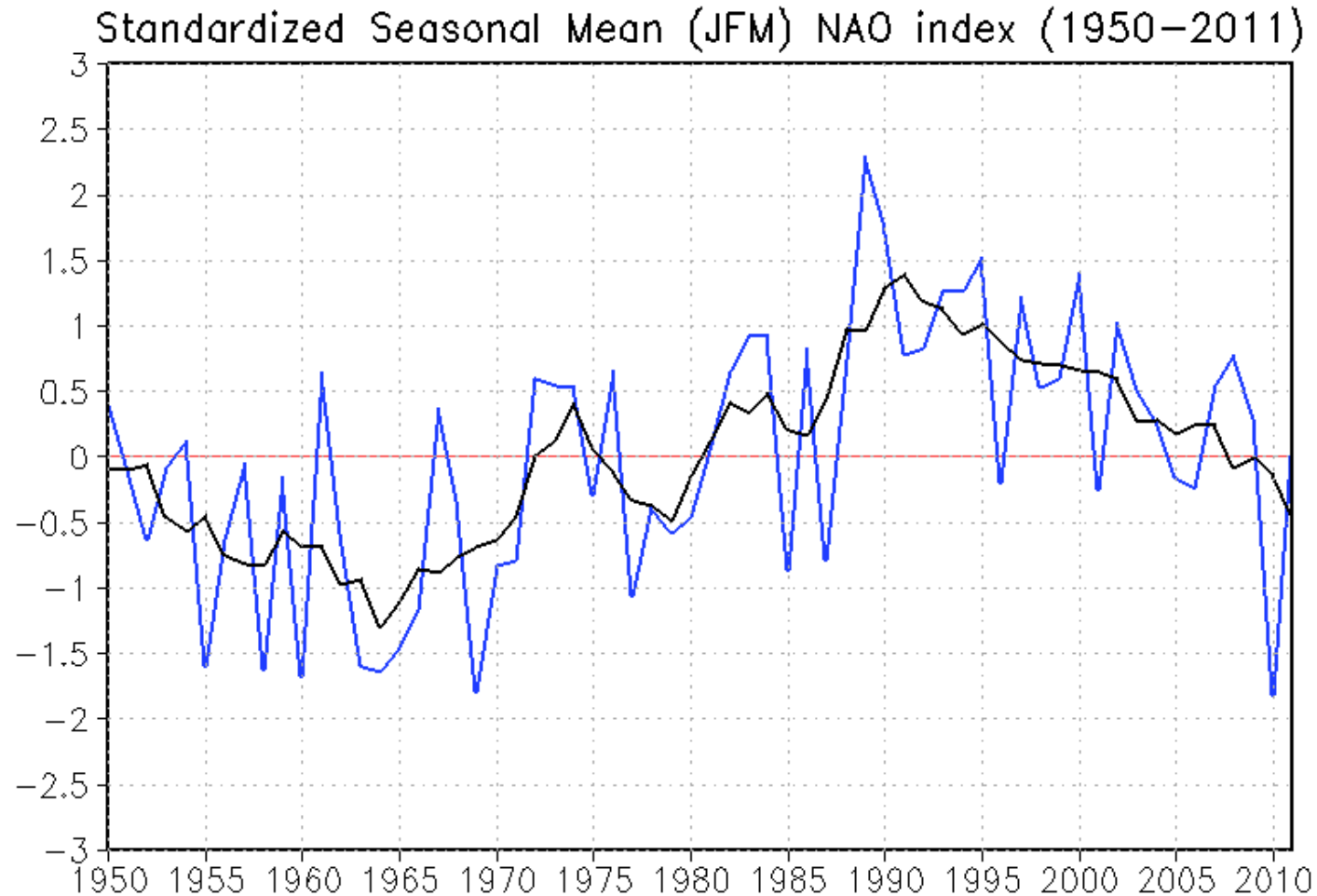
Primary actual determining factor:

NAO / AO (Atlantic / Arctic Ocean phenomenon)

MID-LATITUDE IMPACTS OF NAO:

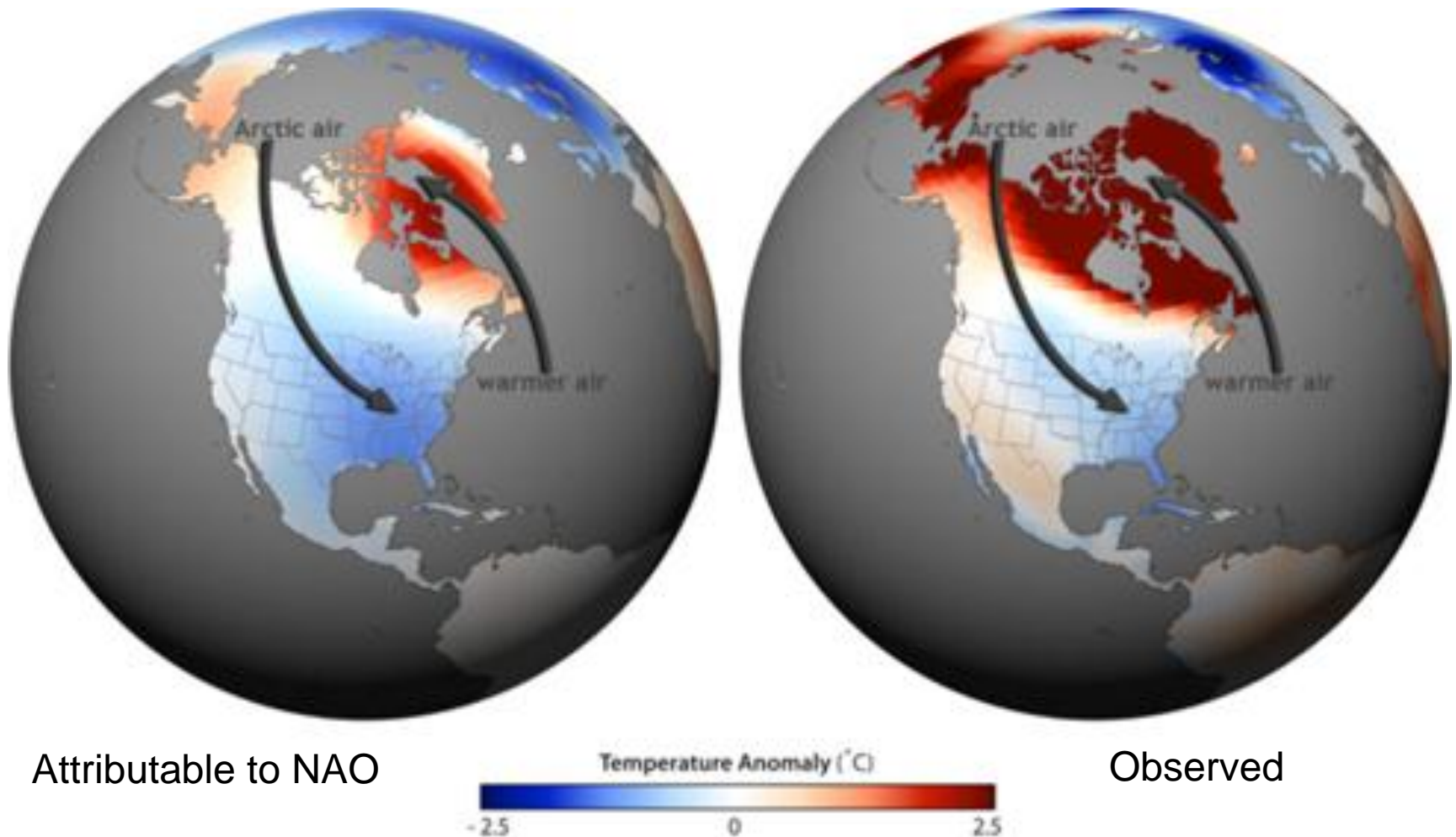
- **Last winter: Extreme cold and snow in Europe (AO)**
- **Winter 2010-11: Several heavy snow events locally**
- **Winter 2009-10: 6th coldest winter at Paducah**

NORTH ATLANTIC OSCILLATION



NOAA / Climate Prediction Center graphic

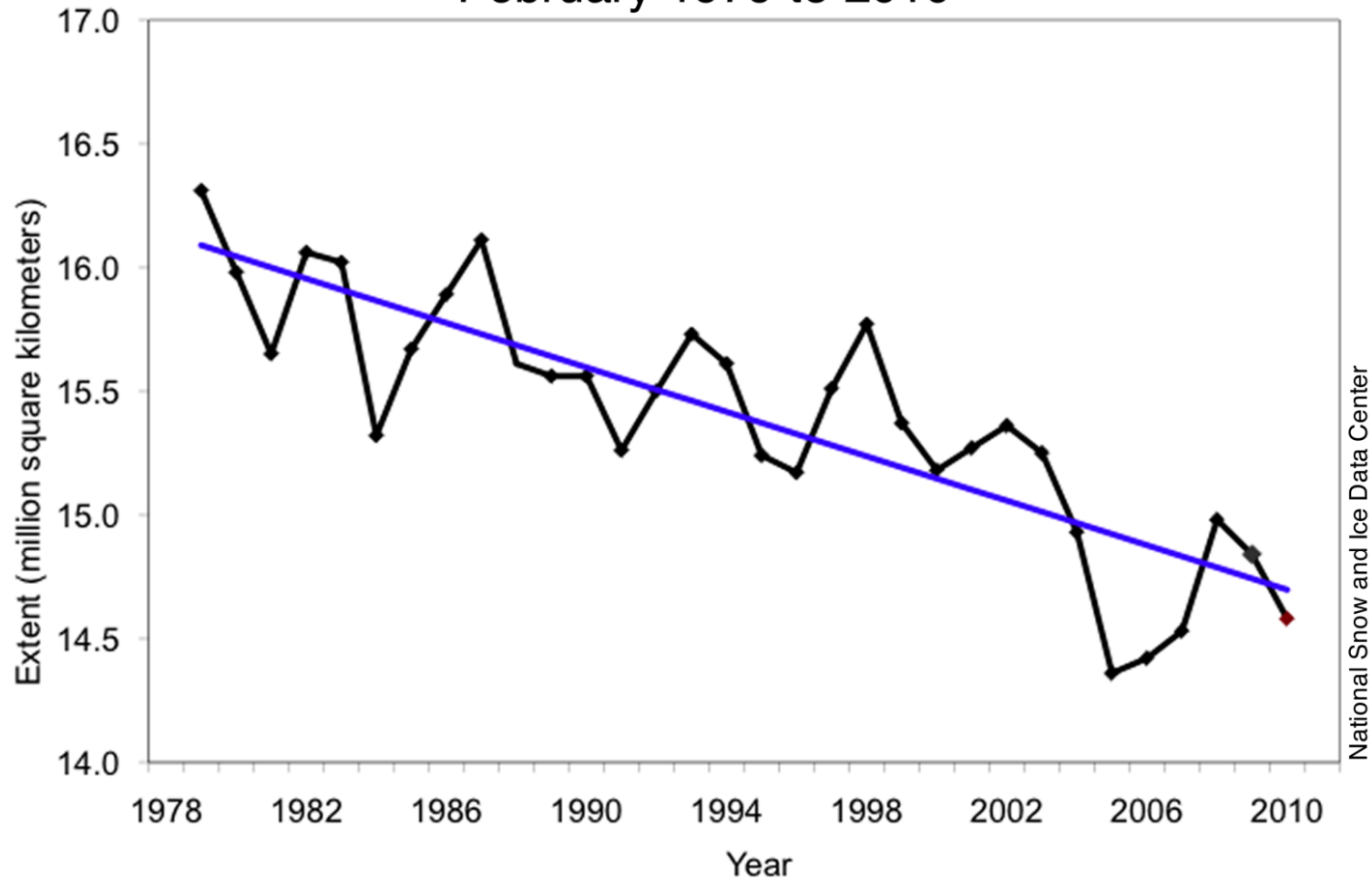
EXAMPLE OF NAO: 2010-11



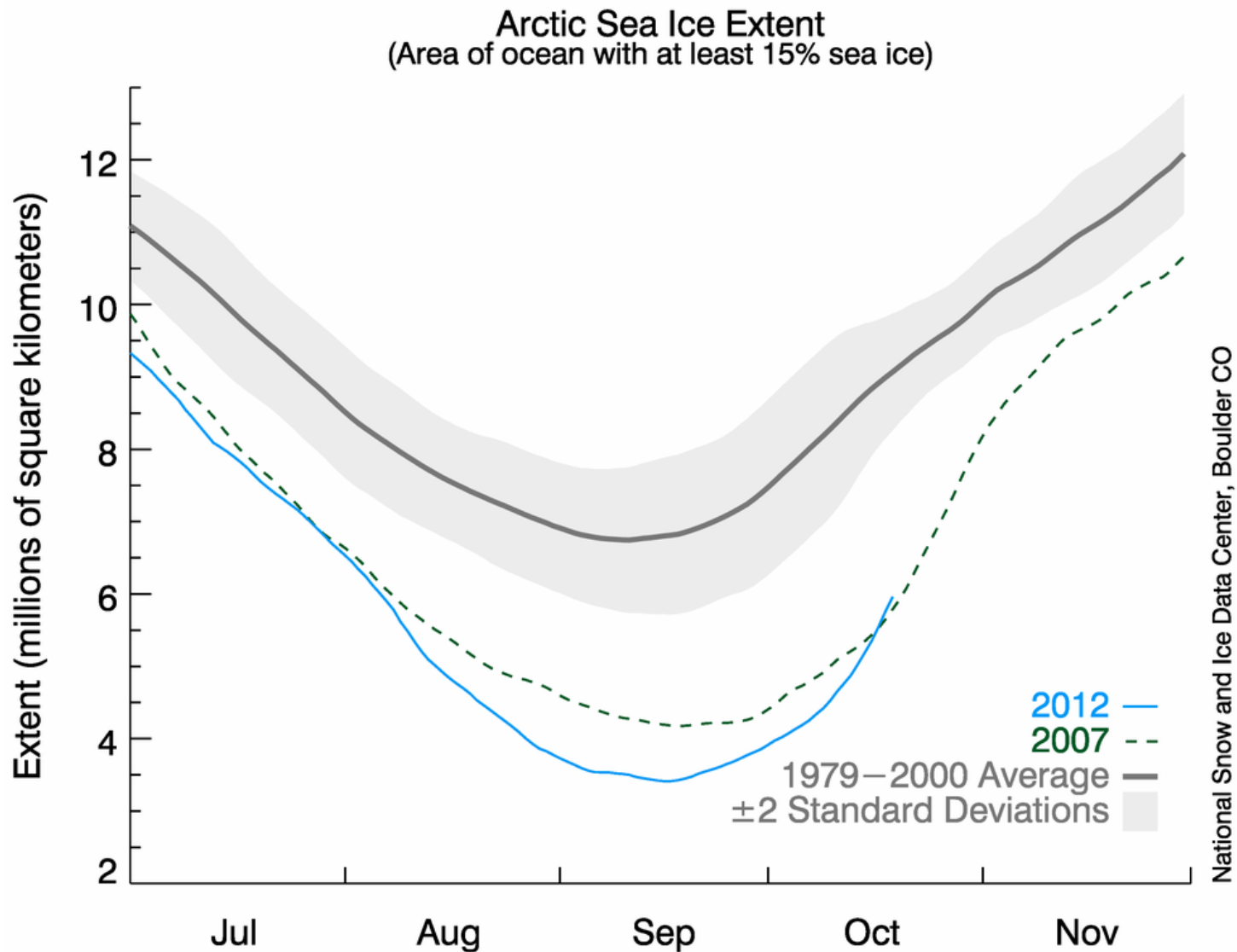
NOAA graphic: Negative phase of NAO

ARCTIC SEA ICE TREND

Average Monthly Arctic Sea Ice Extent
February 1979 to 2010



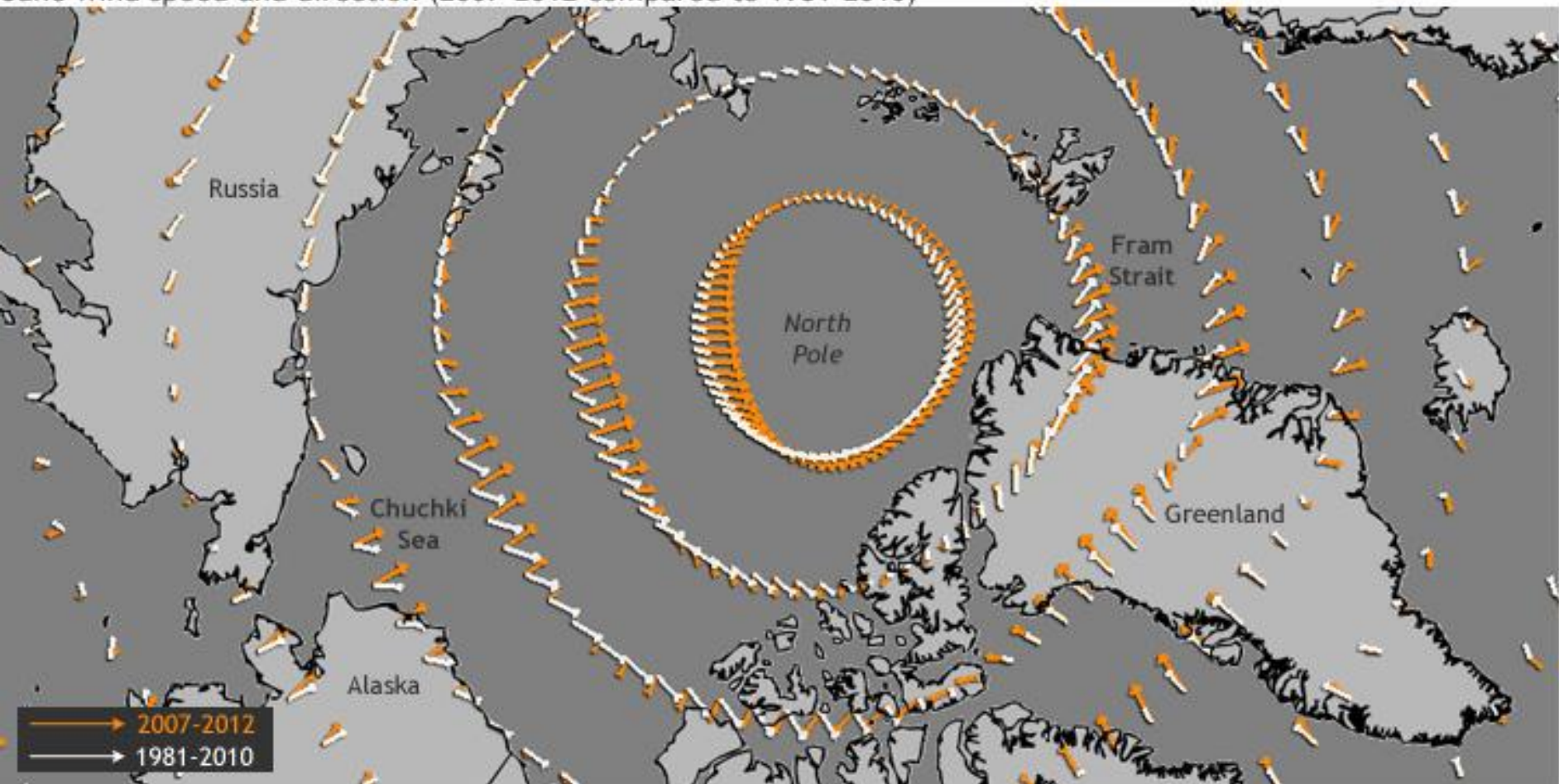
NEW RECORD SET IN 2012



19 Oct 2012

CHANGE IN ARCTIC WIND PATTERNS

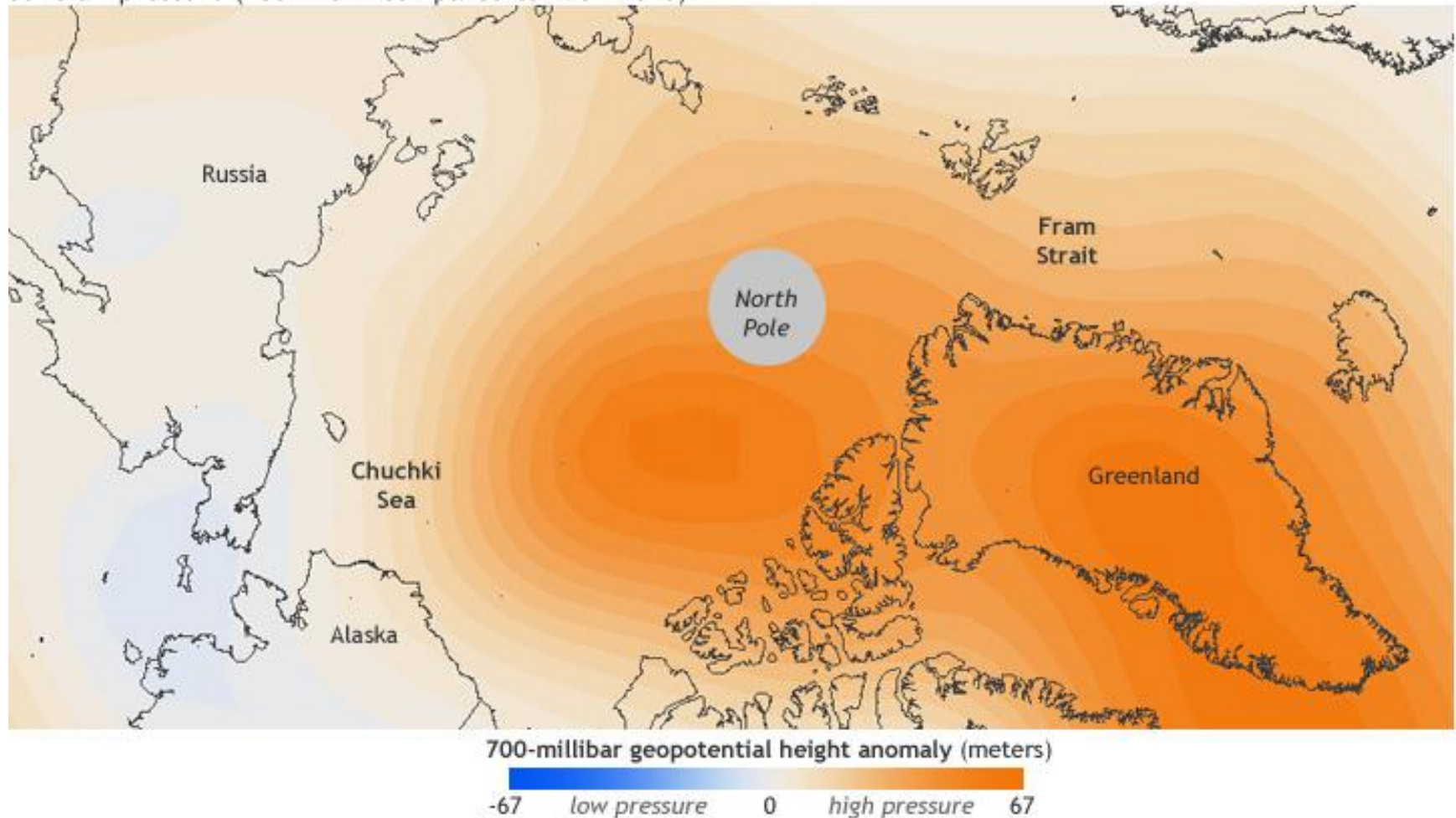
June wind speed and direction (2007-2012 compared to 1981-2010)



NOAA Environmental Visualization Lab graphic

THE GREENLAND BLOCKING HIGH

June air pressure (2007-2012 compared to 1981-2010)



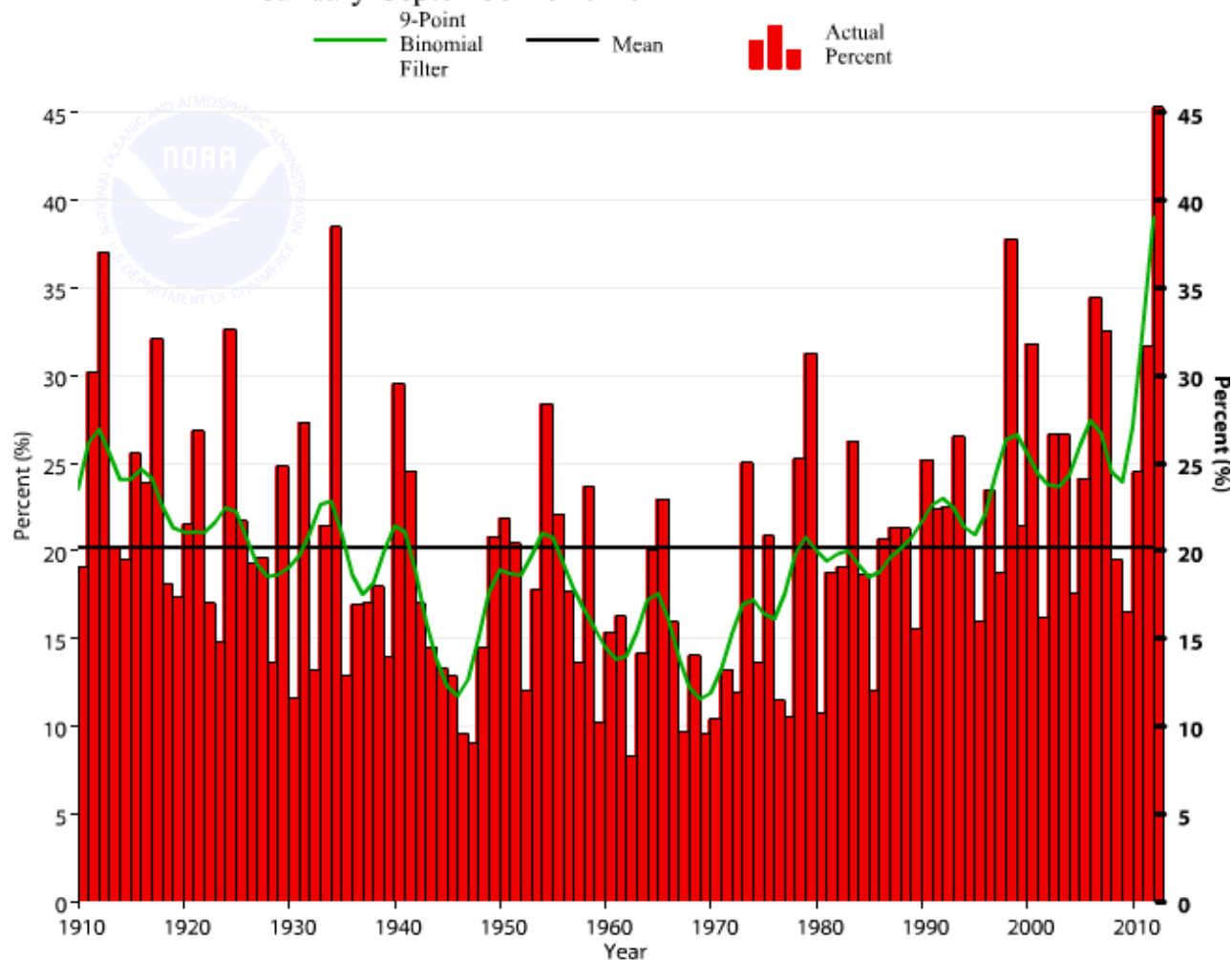
NOAA Environmental Visualization Lab graphic

THE GREENLAND BLOCK

- **Frequently associated with the NAO**
- **Blocks the normal west to east progression of storms (example: Hurricane Sandy turned westward)**
- **Keeps storms stalled off the Northeast Coast, resulting in cold north winds across eastern U.S.**

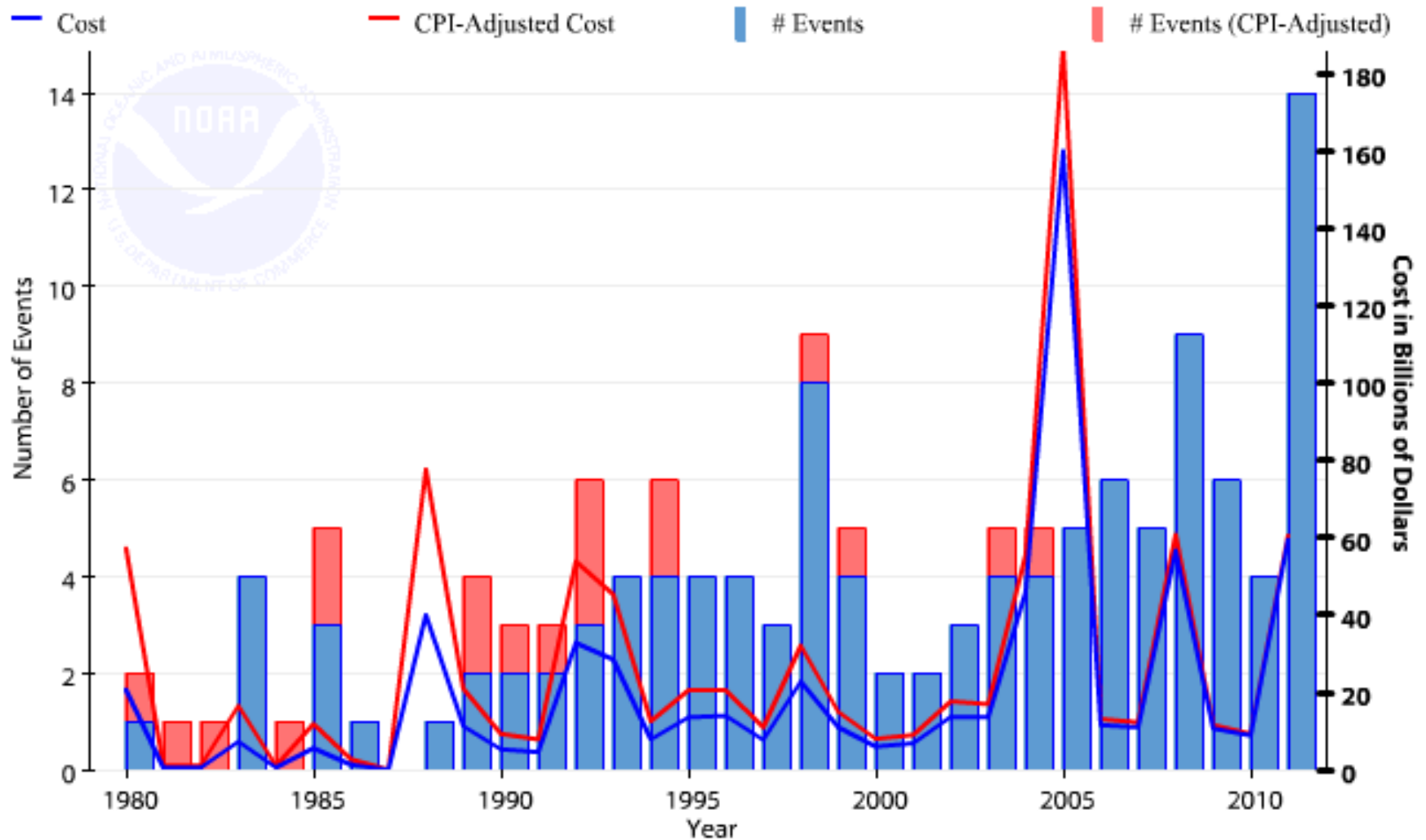
CLIMATE EXTREMES INDEX

Contiguous U.S. Without Tropical Cyclone Indicator
January-September 1910-2012



Graphic from NOAA / National Climatic Data Center

BILLION-DOLLAR DISASTERS



NOAA graphic

Summary:

- North Atlantic Oscillation (NAO) is the wildcard in winter forecasting.
- Sea ice coverage and atmospheric circulation patterns in the Arctic have shifted over the past several years.
- These shifts are thought to influence weather in Greenland, the United States, and western Europe (through NAO and Greenland Blocks). Understanding such links is an ongoing area of research.
- Frequency of extreme weather relatively high since about 2000.